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XXVI. *Some Observations upon Insects that prey upon Timber, with a short History of the Cerambyx violaceus of Linnæus.*

*By the Rev. William Kirby, F. L. S.*

*Read November 5th, 1799.*

NO part of the economy of this terrestrial globe is more worthy of admiration, or furnishes a wider field for inquiry, than the methods by which all that vast variety of substances, animal and vegetable, which are produced from the earth, are kept within their proper bounds, and, when life is departed from them, are reduced to dust; so that a due harmony of parts is preserved, the relative proportion of individuals accurately adjusted to the wants and general good of the system; and those substances which have a tendency to deform or injure it, are in due time removed out of the way, and made to contribute under another form to its support.

Not to mention man, and the various species of quadrupeds, birds, fishes, reptiles and worms, which prey on animal and vegetable life; insects, although very diminutive, are very powerful instruments, in the hands of the great Disposer of events, to promote, sometimes indeed by partial evil, the good of the whole. To them it is given in charge not only to prey on living substances, but also to hasten the dissolution and decomposition of those that are dying or dead. Of these none seem to have a more arduous task assigned them, than those whose office it is to bring on, or

accelerate the decay of the giant inhabitants of the forest. Numerous species of insects, and in various ways, labour in this department (a). Some attack living trees, others those that are dead. Some deposit their eggs in them, that, when hatched, their larva may feed upon the wood; while others seek only a place well sheltered from wet, cold, birds or other insects, for the habitation of of their young. Again, some prey upon the soundest timber; while others make no attempt upon it till it begins to decay:—but all contribute, in one way or other, to the same end; one taking up the office, where another resigns it; till that which from its bulk and solidity appeared calculated to last as long as the earth that gave it birth, by the successive efforts of various kinds of insects, is reduced in no very long time to its original dust. So powerful are the effects produced by instruments which we too often overlook or despise.

To particularize some of the species employed in this work, and to point out what trees they attack either for food, or to secure a sheltered situation for their offspring, may not be unentertaining, or altogether useless. I shall therefore mention a few of the individuals of each of the Linnæan classes, omitting *Hemiptera* and *Neuroptera*, of which I recollect no species that feed or nidificate in wood; reserving the *Coleoptera*, which class sends forth the most numerous bands of these minute pioneers of nature, to the last; and concluding the whole with a short history of the *Cerambyx violaceus* of Linnæus.

Among the *Lepidopterous* insects, the larva of the *Phalena Bombyx*

(a) Insects are not the only labourers employed in this field; the same end is promoted by the *Alge* and *Fungi*. Witness the numerous tribe of *Lichens*, *Tremella*, *Agarici*, *Boleti*, *Auricularia*, *Sphæria*, &c. which derive their nourishment from decaying wood, and assist in its decomposition.

*Coffius*

*Coffus* is known to attain its great size by feeding upon the willow, and other kinds of wood when in a decaying state. The same tree affords nourishment, as we learn from Mr. Lewin (*a*), to the *Sphinx crabroniformis*; as does the poplar to the *Sphinx apiformis* (*b*), and *vespiformis*. The insects of the *Hymenoptera* class bring on the decay of ligneous substances in various ways. The nests and cells of many of the genuine *Vespa* are made of a kind of paper formed of the filaments of wood. I have often been highly amused by seeing the common wasp, which, though a mischievous, is at the same time a very ingenious animal, employed in scraping gate-posts with her strong maxillæ, to collect materials for this purpose; a sight which Reaumur informs us it was long before he could enjoy (*c*). The *Hornet* frequently perforates hollow trunks, to build her paper metropolis in a sheltered situation (*d*). The *Leaf-cutter* bees, of which there are several species all confounded under the common name of *A. centuncularis*, in order to place their *centunculi* (*e*) of curious construction, in perfect security, make their way into the body of various trees. One species selects the willow for this purpose (*f*), another the oak (*g*), or the elm indifferently. *Apis*

(*a*) *Linn. Transf.* Vol. iii. p. 2.

(*b*) *Ibid.* p. 1.

(*c*) *Reaum.* Tom. vi. Mem. vi. p. 180, 181.

(*d*) *Ibid.* Mem. vii. p. 217. I am informed by my friend Sir Thomas Cullum, whose spirit and accuracy of observation throw light upon every branch of Natural History, that in the year 1785, in Mr. Porte's gardens at Ham near Dovedale, the hornets destroyed a great number of the young oaks by making their way into their heart, and there building their nests.

(*e*) *Ibid.* Mem. iv. Tab. 9. fig. 8—181. Tab. 10. Reaumur's species makes its nest under ground; but Geoffroy's (*Hist. ab. des Inf.* Tom. ii. p. 410. n. 5.) and our English ones make theirs in the trunks of trees.

(*f*) *Raii Hist. Inf.* p. 245. Sir E. King, in *Philos. Transf.* abridged by Lowthorp, Vol. ii. p. 773. Willoughby in *Do.* p. 773, 774. Dr. Martin Lister in *Do.* 774.

(*g*) *Apis centuncularis*, *Donovan Brit. Inf.* Vol. iv. Tab. 120.

*maxillofa* (a) nidificates in posts and rails. *Apis violacea*, as we learn from Reaumur (b), constructs curious cells for its young, of several stories, in the supports of espalier trees. *Apis furcata* (c) makes similar cells in decaying wood. Many other insects of this class, particularly *Spheges*, and illegitimate *Vespa*, emerge from cylindrical holes in trees and posts, in which they were nourished in their larva state.

Of *Dipterous* insects, the *Tipula pectinicornis*, singular for the branching antennæ of the male, and many other species of that genus, in their larva state, inhabit putrescent wood (d): and a numerous army of the *Oniscus Asellus*, to name no other insect in the *Aptera* class, is generally to be met with in those parts of decaying trees under the bark, which are deserted by other insects; upon which, from its saw-dust-like excrement, it appears to feed.

Having gone over the other classes, it remains that we mention the devourers of wood amongst the *Coleoptera*. Foremost in the ranks comes the gigantic *Lucanus Cervus*, whose larva feeds upon the decaying wood of the oak (e) and the elm. In the latter is also found the *Lucanus inermis* (f). The ash affords nourishment both to *Lucanus parallelepipedus* and *L. cylindricus*. (*Scarabæus cylindricus* of Linn. but surely a true *Lucanus*.) The several species of the genus *Ips* (*Bostrichus* Fab.) feed upon timber between the bark

(a) Marsham in *Linn. Transf.* Vol. iii. p. 27, 28.

(b) Reaumur, Tom. vi. Mem. ii. Tab. 5.

(c) *Furcata*. A. cinereo pubescens; atra; antennarum articulo primo, fronte, labioque flavis: abdomine apice furcato; tarsis ferrugineis. Panzer. *Fn. Inf. Germ. Init.* No. lvi. Tab. 8. *Obs.* Panzer's insect is the male of this species.

(d) Habitat in carie arborum solitaria larva, pupaque. Schrank. *Enum. Inf. Austr.* p. 423. n. 853. I have found the pupa in the same situation.

(e) In Europæ ligno quercino putrido. *Linn. S.ß. Nat.*

(f) *Inermis*. 2 l. scutellatus, convexus, brunneus, maxillis brevibus dente laterali elevato. Marsham M. S.

and the wood, upon the surface of which they usually trace in feeding, what Linnæus calls pinnated labyrinths, in which a number of lateral lines, nearly parallel with each other, form right angles on each side, with a central one; and thus the bark is finally separated from the wood. Most trees, I imagine, have a particular species of this genus assigned to them. Thus *Ips piniperdus* attacks the fir. *Ips Scolytus*, the elm. *Ips niger* (a), *I. griseus* (b), *I. rufescens* (c), and, I believe, *I. nebulosus* (d), undertake the barking of the ash. *Ips fuscus* (e), and probably more species, feed upon the oak. Even shrubs do not escape, for whin or furze (*Ulex europæus*) is preyed upon by the minute *Ips rhododactylus* (f), which I have frequently taken coming out of the larger sticks of a dead whin-fence in my own garden. Next to these come the *Ptini*; several species of which are found in wood. I meet with *Ptinus tessellatus* in the willow, and I believe it will attack deal or any soft wood. It is one of those insects that is called the death-watch, from a certain sound which it makes at regular intervals resembling the clicking of a watch, which, the vulgar superstitiously imagine, forebodes the death of some person in the house in which it is heard. The *Ptinus pœlinicornis* also, and *Pt. cylindricus* (g), feed in the same tree.

(a) *Niger*. 24. I. subcylindricus, niger, thorace punctulato, elytris crenato-striatis, plantis piceis. Martham M.S.

(b) *Griseus*. 9. I. ferrugineus, capite nigro, supra ferrugineo testaceoque varius. Ibid.

(c) *Rufescens*. 10. I. subtus luteus, supra rufus, elytris luteo nebulosis. Ibid.

(d) *Nebulosus*. 8. I. subvillosus, corpore nigro cinereoque vario. Ibid. *Boschnibus Fraxini*: ater fusco cinereoque varius, elytris punctato striatis, antennis testaceis clavâ cinereâ acutâ. *Panz. Fn. Inf. Germ. Init. n. 66. tab. 13.*

(e) *Fuscus*. 5. I. fuscus, antennis pedibusque testaceis; elytris retusis confertius punctulatis. Martham M.S.

(f) *Rhododactylus*. 22. I. niger, villosus totus, plantis rufis. Ibid.

(g) *Cylindricus*. 6. *Pt.* subcylindricus fusco ferrugineus; thorace gibbo læviusculo; antennis pedibusque rufescentibus. Ibid.

But of all the species of this genus; *Ptinus pertinax* is the most mischievous; any kind of wood that begins to have a tendency to decay, it attacks without mercy. I speak this from experience, having a chamber in my house, the floor of which is quite filled and perforated in every direction by this destructive little insect; and my walnut-tree chairs it has nearly reduced to the same state that Linnæus observes it had done his (a).

Amongst the *Curculiones*, the late ingenious Mr. Curtis has informed us, that *G. Lapaibi* feeds upon the willow (b). *C. lignarius* (c) preys upon the trunk of putrid elms; and *C. atramentarius* (d) I have found in all its states in old rails under bark. There is one insect, which although not as yet discovered in England, ought not to be passed over, as its history furnishes a striking proof how useful the study of Natural History may be made when applied to Œconomics: the insect I allude to is the *Cantbaris navalis* of Linnæus. Our president, the liberal possessor of the Linnæan treasures, informs me, from the *Iter Westrogothicum*, that the oak timber in the royal dock-yards in Sweden being observed to have suffered considerable injury from some unknown animal, Linnæus was desired by His Swedish Majesty to trace out the cause, and point out some remedy which might prevent the further progress of so alarming an evil. Upon inquiry he discovered that the mischief was occasioned by this *Cantbaris*, and he recommended that the timber should be immerfed in water during the usual time of this insect's

(a) Terebravit et destruxit sedilia mea. *Linn. Syst. Nat.*

(b) *Linn. Transf.* Vol. I. p. 86.

(c) *Lignarius*. 113. *C. nigro-piceus* totus, rostro crassiusculo, thorace punctato, elytris abbreviatis. Marsham M.S.

(d) *Atramentarius*. 165. *C. ater* obovatus, thorace utrinque unidentato, elytris striatis. Ibid.

appearance. This advice was pursued, and the dock-yard timber received no further injury.

We have so few species of the genus *Buprestis* in England, and those that we have are so seldom met with, that it is no wonder if the habitation of their larvæ is not commonly known; both De Geer (*a*), and Geoffroy (*b*), however, are of opinion that they are inhabitants of wood. But the timber-merchant and the builder have no greater enemies than the genuine *Cerambyces*, under which genus I would, with De Geer (*c*), include those only which have reniform or lunar eyes, excluding *C. Cursor*, *Lamed*, *meridianus*, *Inquisitor*, &c. and taking in *Leptura Alni*, *arcuata*, *arietis*, *mystica*, *præusta*, &c. of Linn. These insects, as far at least as we are acquainted with them, not only devour the surface of the wood that lies under the bark, but penetrate deep and in all directions into the solid timber. What havoc must the larva of so large an insect as *Cerambyx coriarius* make in an oak tree (*d*)! I have taken the pupa of *Cerambyx arcuatus* out of the heart of a solid piece of the same timber, which had been perforated by that insect in all directions. Once in the height of summer, when the mid-day sun shone out warm, I was very much entertained with seeing several of these fine insects fly down upon a pollard oak that had been felled and the bark left upon it, and run all over it with great velocity, seeking, it is probable, a place proper for depositing their eggs.

Amongst the *Cerambyces* of this country, the ingenious Mr. Donovan, in his elegant work upon British Insects (*e*), has figured *C. vi-*

(*a*) *De Geer*, Tom. iv. p. 131.

(*b*) *Geoffr.* Tom. i. *Cucujus*. n. 1. p. 125. n. 2. p. 126.

(*c*) *De Geer*, Tom. v. p. 55, 56.

(*d*) Habitat in betulis putridis. *Linn. Syst. Nat.* But I have known it cut out of an oak.

(*e*) *Donov. Brit. Inf.* Vol. ii. p. 73. Tab. 61. fig. 1.

*laceus*, and informs us that it probably feeds upon the fir, but at the same time expresses a strong suspicion that this beautiful insect is not originally English. How far this may be true, it is not my intention to inquire; I shall only observe, that it is now become but too common, at least in one spot, in the neighbourhood of London, as will appear from those circumstances of its history which I am going to relate.

My friend and relation Mr. James Trimmer of Old Brentford (a), an attentive observer of nature, more particularly of the economy and habits of insects, and to whom I am indebted for much curious and interesting information in this branch of science, some time ago wrote to inform me, that he had found this insect in its three states in fir-timber, and accompanied this intelligence with many ingenious remarks. Expecting him soon to visit me at Barham, in my answer I requested him to bring with him some of its *larvæ* and *pupæ*, and also some pieces of the wood upon which they had been feeding; at the same time I desired him to continue observing their motions. What follows relative to the history of this *Cerambyx* is chiefly compiled from his communications, which I thought too interesting to be lost.

The fir in which Mr. Trimmer first found this insect was of English growth, of the spruce kind, which had not been felled many years, and had originally grown near the spot on which the building was erected in which it was employed: it did not appear to have been attacked more than two years when Mr. Trimmer made his observations; and it suffered most in 1798, when the *larvæ* had multiplied so much, and been so extremely voracious as to have left very little food for another year. Some Scotch fir in an

(a) Son of Mrs. Trimmer, so justly celebrated for her humane and successful exertions to procure the great blessing of a religious education for the children of the poor.

adjacent building had also been attacked by them. Nor does this insect so entirely confine itself to fir, as never to attack any other kind of wood; for, when the *imago* first came forth in considerable quantities, Mr. Trimmer took several and placed them upon some pieces of fir which were under cover: but, what seems remarkable, the insects quitted these, and went and deposited their eggs in some pieces of apple, pear, cherry and plum, which had been selected for turning, and were piled up in the open air.

It is worthy of observation, that this destructive little animal attacks only such timber as has not been stripped of its bark; a circumstance which ought to be known and attended to by all persons who have any concern with this article; for the bark is a temptation, not only to the insect in question, but also to a numerous tribe both of this and other genera; and a great deal of the injury which is done to timber would be prevented, if other trees besides the oak were barked as soon as they are felled. The principal danger, however, arises from neglecting this precaution with respect to such timber as is used in buildings, especially in those places that are accessible to insects, for in this case it will not last out half its time.

But, to proceed with our history, the female of this insect is furnished with a flat, retractile tube, or rather aculeus (*a*), which she inserts, it should seem, (for Mr. Trimmer was never so fortunate as to see this operation performed,) between the bark and the wood to the depth of about a quarter of an inch, and there she deposits her egg, since not more than one appears to be laid in one place. By stripping off the bark it is easy to trace the whole progress of the *larva*, from the spot where it was newly hatched, to that where it has attained its full size (*b*). At first it proceeds onwards,

*a*) Tab. 12. fig. 15. c.

*b*) Fig. 13. a—c.

but

but in a serpentine direction, filling the space which it leaves behind it with its excrement, resembling saw-dust, and so stopping all ingress to enemies from without; but when it has arrived at its utmost dimensions, it does not confine itself to one direction, but works in a kind of labyrinth, eating backwards and forwards, which gives the wood under the bark a very irregular surface (*a*); by this mean its paths are of considerable width. Its attacks are not confined to the solid timber, but in its progress it eats away an equal portion of the bark. The bed of those paths where it has been at work, exhibits, when closely examined, a curious appearance, occasioned by the erosions of its maxillæ, which excavate an infinity of little ramified channels. When the insect is about to assume the *pupa*, it bores down obliquely into the solid wood, to the depth sometimes of three inches, seldom if ever less than two. These holes (*b*) are nearly semicylindrical, expressing exactly the form of the grub. One would wonder how so small and seemingly so weak an animal could have strength to excavate so deep a mine: but when we see its maxillæ, our wonder ceases; these are large, thick, and solid sections of a cone divided longitudinally (*c*), which in the act of mastication apply to each other the whole of their interior plane surface, so that they grind the food of the insect like a pair of millstones. Early in March all the *larvæ*, except some sickly ones, were observed to have entered the wood in this manner; some began so soon as October. At the place in the bark opposite to this hole, the *imago* gnaws its way out of its prison when it makes its appearance, which took place first on the 20th of May, and continued till about the 20th of June; it returns by the same passage which the *larva* had excavated previous to assuming the *pupa*.

(*a*) Tab. 12. fig. 14.

(*b*) Fig. 14, a a a.

(*c*) Fig. 5. b b. Fig. 7. b.

Mr.

Mr. Trimmer thinks that these insects fly only during the night, as in the day-time he always found them standing upon the piece of wood from which they had been disclosed. The case is different with *Cerambyx arcuatus*, which, as I observed before, flies at mid-day: but perhaps this circumstance may depend much upon the state of the atmosphere, or the hour of the day; for many insects have their certain hours for flying; a singular instance of which I had once an opportunity of witnessing. In the beginning of July 1793, about ten o'clock in the morning, as I was passing through a meadow, I was surpris'd with the appearance of what at first seem'd to me to be myriads of bees flying about the hedges and trees; but, upon taking some of them, they prov'd to be *Scarabeus argenteus* (*Melolontha argentea* Fab.); upon my return through the same field, a little after noon, I was astonish'd to find that of this infinite host of insects not a single one was to be seen.

I have now communicated all the observations which Mr. Trimmer made with respect to the history of this insect; these I hope will not be thought unworthy of the attention of the Linnean Society, since they furnish an useful lesson in Œconomics, and supply an additional proof of the utility of the study of Natural History, and to what good purposes it may be directed.

Mr. Trimmer, when he came to Barham, brought with him specimens of this insect in all its states, as also some pieces of the wood that had been attacked by it, from which I employ'd my ingenious friend the Rev. Peter Lathbury, F. L. S. to make the drawings which accompany this paper. Nothing now remains but to close this account with a description of each state of the insect.

CERAMBYX

CERAMBYX.

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Thorace inermi subrotundo, f. ex globoso depresso.

*violaceus*. 70. C. thorace mutico subrotundo pubescente, corpore violaceo, antennis mediocribus. *Linn. Syst. Nat. ed. 12. p. 635. n. 70. Fn. Succ. ed. 2. n. 667. Vill. Ent. Eur. tom. 1. p. 247. n. 71. Schrank. Enum. Inf. Austr. p. 147. n. 277. Poda Mus. Græc. p. 36. Fn. Frid. n. 130.*

C. violaceus nitens; corpore, thoraceque mutico subrotundo, depresso; femoribus clavatis, antennis mediocribus nigris. *De Geer. tom. 5. p. 88. n. 24.*

C. thorace subpubescente corpore violaceo antennis brevibus. *Lin. Syst. Nat. Ed. Gmel. p. 1848. n. 70.*  
Callidium violaceum. *Fab. Ent. Syst. Em. tom. 1. par. 2. p. 320. n. 9.*

Cantharis nigra thorace rotundato, elytris cæruleo-centibus. *Gadd. Diff. 28.*

Stenocorus violaceus. *Scop. Ann. Hist. Nat. V. p. 97. 59.*

FIGURÆ. *Frisch. Inf. 12. tab. 3. icon. 6. fig. 1.*

*Schæff. Ic. tab. 4. fig. 13.*

*Oliv. Inf. 70. tab. 7. fig. 77.*

*Herbst. Arch. tab. 26. fig. 10.*

*Ramer. Gen. Insect. p. 9. tab. front. fig. 2.*

*Donovan. Brit. Inf. vol. 2. p. 73. tab. 61. fig. 1.*

LONG. CORP. a lin.  $4\frac{2}{3}$  ad lin.  $7\frac{1}{2}$ .

DESCRIP. *Larva* (a) apoda, pallida, plicata, subpilosa, supra convexa, subtùs planiuscula, caput versùs incrassata, segmentorum tredecim. *Caput* (b) magnum convexum, antennulâ (c) triarticulatâ, pilosulâ, utrinque instructum. *Os* rufescens, labio (d) apice rotundato ciliato supernè clausum: labio inferiori (e) trifido. *Iobis* lateralibus palpo unico (f), intermedio duobus (g), instructis. *Maxillæ* (h) horizontales, fuscæ, semiconicæ, validissimæ, per totam superficiem planam interiorem conniventes.

*Pupa* (i) incompleta, oblonga, pallida; omnes imaginis partes, membranâ tenuissimâ tectas, exhibens.

*Imago* (k). *Corpus* piceo-nigrum subpilosum; supra violaceum, excavato-punctatum, punctulis creberrimis confluentibus. *Caput* magis exsertum quam in reliquis genuinis Cerambycibus nostratibus. *Maxillæ* arcuatae apice conniventes. *Palpi* quatuor capitati, clavâ compressâ truncatâ, exterioribus longioribus. *Antennæ* subsetaceæ, corpore subbreiores, atro-violaceæ pilosulæ, articulis ultimis subtomentosis nigris. *Oculi* lunares basin antennarum ponè amplexantes. *Gula* nitida. *Thorax* ex globoso depressus, latior quam longus, f. lateribus gibbis. *Sternum* violaceum, mucrone brevi instructum. *Scutellum* medio depressum. *Elytra* linearia vix marginata, e violaceo nitentia ac velut aurata, apice rotundata humeris gibbis. *Alæ* fuscescentes; nervis,

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|-----------------------------|--|---------------------------------|
| (a) Tab. 12. fig. 4.        | (b) Fig. 5, b.                         | (c) Fig. 5, a a; and fig. 8, b. |
| (d) Fig. 7, a; and fig. 12. | (e) Fig. 9.                            | (f) Fig. 10. h.                 |
| (g) Fig. 11, a a.           | (h) Fig. 5, b b; fig. 7, b; fig. 8, c. |                                 |
| (i) Fig. 2, 3.              | (k) Fig. 1.                            |                                 |

margineque

margineque crassiori, nigris. *Abdomen* supra planiusculum, subtus convexum. *Pedes* atrii, interdum atro-violacei, femoribus clavatis apophysi biarticulatâ infidentibus: tarsi nigri quadriarticulati, unguibus rufescentibus.

Variat capite thoraceque virescentibus, aliquando supra totus virescens.

#### EXPLANATION OF TAB. XII.

- FIG. I. *Imago* of *Cerambyx violaceus*, natural size.
2. *Pupa* of ditto, the upper-side.
  3. — ditto, the under-side, to shew the mode in which the antennæ are folded.
  4. *Larva* of ditto, a small specimen, and rather shrunk for want of food.
  5. — upper side of the head magnified. (a a) Its antennulæ. (b b) Its maxillæ.
  6. — the under side of the head.
  7. — a portion of the head greatly magnified. (a) The upper lip. (b) Maxilla.
  8. — a longitudinal section much magnified, to shew the folds of the abdomen more distinctly. (a) The head. (b) The antennula. (c) The maxilla.
  9. — under-side of the head much magnified, to shew the under lip. (a a) Its lateral lobes. (b b) Their feeler. (c) The intermediate lobe. (d d) Its feelers.
  10. — one of the lateral lobes of the under lip exhibited separately, much magnified. (a) Its summit rounded and fringed with hair. (b) Its feeler.

- FIG. 11. *Larva*—the intermediate lobe of the under lip. (a a) Its feelers.
12. ——— the upper lip much magnified. (a) Its summit round and fringed.
13. A portion of the wood with the bark taken off, to show the progress of the larva from its being first hatched till it begins to work in all directions. (a-c) The serpentine path of the insect. (a) The point where the egg was hatched. (b) The excrement of the insect preventing all access to it.
14. A portion of wood of irregular surface, upon which the larvæ have been long at work. (a a a) Semicylindrical holes where it has bored down into the solid wood.—A specimen of this sent to the Society.
15. Anus of a female, to shew the instrument by which she is enabled to introduce her eggs between the bark and the wood. (a) The anal segment of the abdomen. (b) A flat vagina, into which I suppose the aculeus is withdrawn when unemployed, and which itself is retractile within the anal segment. (c) The aculeus flat and bifid at its apex.